REMARKS

Claims 1-18 are pending in the application. Claims 1-18 are rejected. Claims 1-2, 4-9, 13, 15, 17 and 18 are amended herein. Claim 3 is cancelled. All rejections are respectfully traversed.

An IDS was submitted on November 4, 2004, according to the Examiner's comments.

Claims 1-18 are rejected under 35 U.S.C. 101 as drawn to non-statutory subject matter.

As amended, the claims clearly indicate that the invention can be used to model interactions between graphical objects represented as models.

The invention is a method for modeling interactions between a plurality of deformable graphics objects. The specification makes it quite clear that the graphical objects can be represented by a wide variety of conventional models.

"*For example, the models can be in the form of range images, point clouds, triangle meshes, or implicit functions.*"

The specification also makes it clear that the invention is useful for animation and modeling real world physical phenomena.

"*Because the models can be in many forms, our method is particularly suited for animation and physical modeling where many different model forms are*

often used in conjunction depending on production cost and time requirements, and available technologies. As an advantage, the models 101 can uses different representations. For example, one model can be derived from range images, and the other model can be in the form of a polygon mesh. For real-world physical simulations, for example, atomic interactions, or climatic and astronomic simulation, the time steps can range from fractional seconds to years or light-years. For example, for certain interaction properties, such as force fields, the models can interact with each other at a distance, prior to physical contact."

The specification also makes it clear that there are a variety of possible interactions between graphic objects that can be modeled. For example, the interaction can cause deformations of one or more objects. The interaction procedure can be an impact procedure, a collision procedure, a penetration procedure, an intersection procedure, or a proximity interaction procedure.

Although the graphical objects are deformable, they do not necessarily need to deform, depending on their material properties. For example, an egg impacting a sponge, easily deforms the sponge. An egg interacting with a hammer catastrophically deforms the egg. Similarly, object can interact at a distance via force fields, the objects can attract or repel with deformation, partial deformation, or none at all. For example, if the graphical objects represent gas clouds, they can pass through each other.

All these interactions depend on the nature of the various interaction procedures, the properties of the objects, and the forces associated with the objects and the distance between the objects.

It should also be easily understood that the modeling as claimed can be visualize with any number of well known rendering techniques, using animation, or a simulator. It should also be understood that the graphical objects do not necessarily need to represent real work objects or physical phenomena. The graphical objects can also be virtual objects as used in video games or simulations. It should also be understood that a simple binary signal could indicate whether a potential overlap can occur, or not.

Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

The claims are amended herein to overcome the Examiner's rejection.

Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

The claims are amended to make the scope of the claims more definite.

Claims 1-4 and 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Desbrun et al., "Adaptive Sampling of Implicit Surfaces for Interactive Modeling and Animation," In Proceedings DTC95, 1995, in view of Greene et al. (U.S. Patent 5,579,455).

According to the invention, models representing graphics objects are represented by adaptively sampled distance fields (ADFs). ADF methods are

well known in the art, and described in detail in the specification, as methods that adaptively sample a signed distance field of an object and store the sample values in a spatial hierarchy. ADFs were first disclosed in U.S. Patent Application Sn. 09/370,091 "*Detail-Directed Distance Fields*" filed by Frisken et al. on August 6, 1999, now U.S. Patent 6,396,492. Dresbrun was published in 1995, before AFDs were invented.

Dresbrun describes various types of well-known interaction procedures for modeling interactions, such as collisions, between graphics objects. However, in Dresbrun, "after each deformation due to interactive modeling or animation, seeds migrate along their axis to reach the iso-surface." There, it is readily apparent that Dresbrun alters the original skeleton of each object involved in an interaction. The invention generates a new ADF of the interaction (overlap) region for each object, i.e., third and furth adaptively sampled distance fields. Dresbrun alters the objects according to an interaction. The invention, for each object, generates an ADF representing the interaction. Dresbrun can never be used to make the invention obvious.

It should now be understood that Dresbrun can never teach, suggest, show, or describe generating adaptively sampled distance fields, as claimed. Further, there is no mention of any type of distance fields in Dresbrun at all.

Dresbrun describes sampling an implicit surface. ADFs adaptively sample a signed distance field. There is no correlation between Dresbrun and what is claimed. Dresbrun can never be used to make the invention obvious.

Greene describes a graphics rendering method where rendering primitives are stored in a spatial hierarchy, e.g., an octree, and render the octree recursively, where each recursive step determines if the primitive is hidden, or will be displayed. Here again, Green issued in 1996, well before ADFs were invented. Further, nothing in Greene suggests storing an adaptively sampled signed distance field in a spatial hierarchy. A person of ordinary skill in the art would never confuse geometric primitives, such as triangles or polygons, with an adaptively sampled signed distance field.

Claims 4 and 14-17 each further include steps that involve operations on adaptively sampled distance fields. There is no teaching of ADFs in the references cited.

Dependent claims 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Desbrun et al. ("Adaptive Sampling of Implicit Surfaces for Interactive Modeling and Animation") in view of Greene et al. (U.S. Patent 5,579,455) and in further view of Basdogan et al. (U.S. Patent 6,704,694).

Each of claims 5-12 include operations using adaptively sampled distance fields. As stated above, neither Desbrun nor Greene describes adaptively sampled signed distance fields. Desbrus samples implicit surfaces. Greene stores rendering primitives in a Z-buffer in a spatial hierarchy for recursive rendering.

Basdogan cannot cure the defects of Desbrun and Greene. Basdogan describes techniques for determining impact forces and collision penetration between

graphics objects represented as polygon models. Further, Basdogan claims Oct. 16, 1998 as its priority date, which also precedes the invention of ADFs.

All rejections have been complied with, and applicant respectfully submits that the application is now in condition for allowance. The applicant urges the Examiner to contact the applicant's attorney at the phone and address indicated below if assistance is required to move the present application to allowance. Please charge any shortages in fees in connection with this filing to Deposit Account 50-0749.

Respectfully Submitted,

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